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H4B
Selected US specifications from IPC sub-class H04B

(54) Non-contact identification system

(57) To identify individual people or vehicles without any need for action on the part of the people concerned, a compact transponder unit is carried on each person or vehicle to be identified. Each transponder unit includes an optoelectronic detector 11, and an optoelectronic emitter 18, which is capable of transmitting a signal embodying a code unique to the respective unit. Interrogator means, also incorporating an optoelectronic detector 5 and an optoelectronic emitter 4, are provided at fixed locations such that each transponder unit is caused to transmit its unique code upon reception of an interrogation signal from the optoelectronic emitter 4 of the interrogator means, which code signal is then received and processed by the interrogator means.

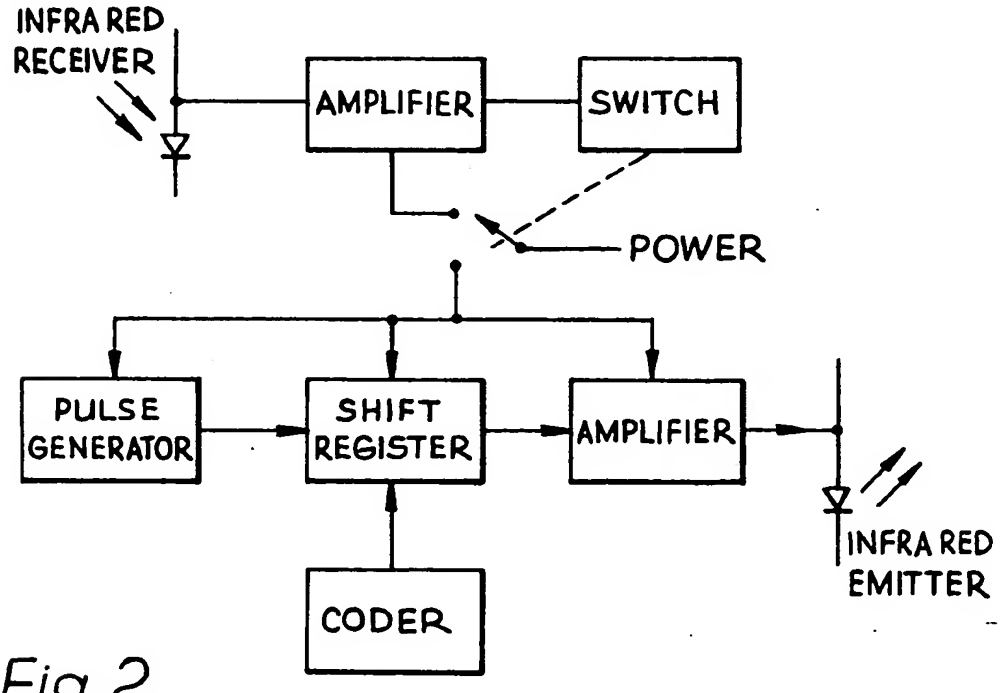

Fig. 2

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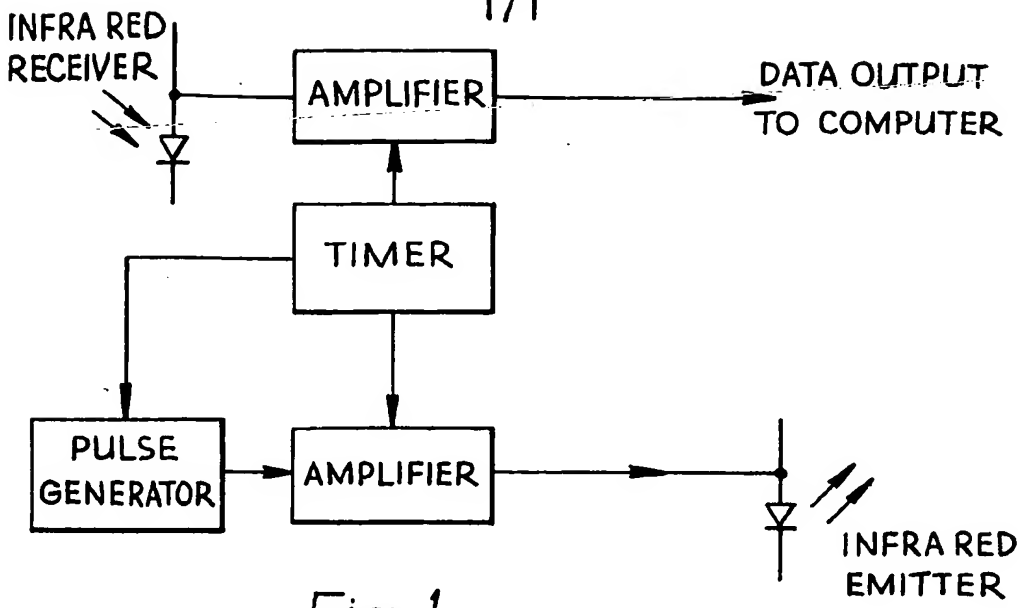
INFRA RED
RECEIVER
AMPLIFIER
DATA OUTPUT
TO COMPUTER
TIMER
PULSE
GENERATOR
AMPLIFIER
INFRA RED
EMITTER

Fig. 1

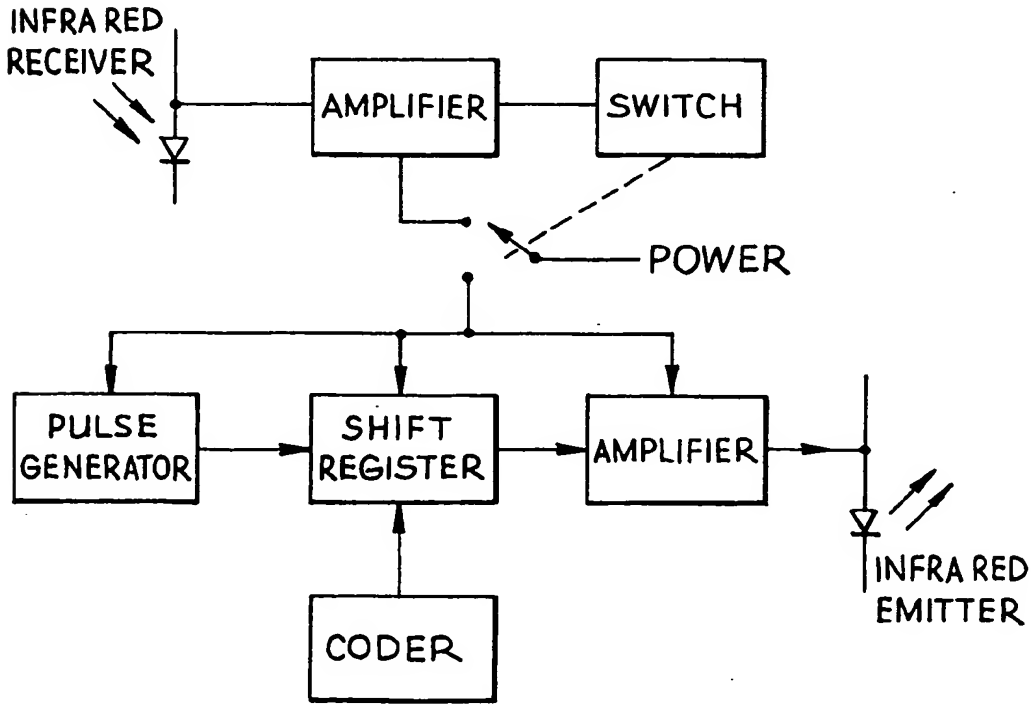
INFRA RED
RECEIVER
AMPLIFIER
SWITCH
POWER
PULSE
GENERATOR
SHIFT
REGISTER
AMPLIFIER
INFRA RED
EMITTER
CODER

Fig. 2

SPECIFICATION

Non-contact identification system

This invention relates to a system of non-contact identification of people or vehicles.

Many methods are known of identifying a person such as an identification card containing the person's photograph or a coded card which may be read by a card reader, but all such systems tend to require physical action on the part of the person.

According to the present invention a system of non-contact identification comprises a compact transponder unit carried on each person or vehicle to be identified, each transponder unit including an optoelectronic detector and optoelectronic emitter, the latter being capable of transmitting a signal embodying a code unique to the respective unit, and interrogator means, also including an optoelectronic detector and an opotoelectronic emitter, such that each transponder unit is caused to transmit the signal embodying its unique code upon detection of an interrogation signal from the optoelectronic emitter of the interrogator means, which code signal is then received and processed by the interrogator means.

Within each transponder unit, its unique code is preferably loaded into an input serial output shift register by a coder. If the transponder coders each have a sixteen bit capacity, in excess of 65,000 unique codes can be generated. However, for any given system the number of bits used in the coders may be chosen to give an appropriate number of unique codes.

The transponder units must be carried on the persons or vehicles to be identified in such a manner as to have a clear view of the immediately surrounding area. In other words they must, in the case of people, be carried externally of each person's clothing, or, in the case of vehicles be carried externally or displayed in a window.

The interrogator means must be mounted at an appropriate location which will be passed by the people or vehicles to be identified. The optoelectronic emitter part of the interrogator means transmits signals to interrogate the coded transponder units carried on the people or vehicles passing by. When the optoelectronic detector of one of the transponder units receives the interrogation signal, the optoelectronic emitter of that unit is caused to transmit its unique n-bit code, in the form of a pulsed signal. This coded signal is repeated several times so that the integrity of the transmission can be checked by the interrogation means which receives same.

In general, the interrogator means will be located adjacent to an entry/exit point to a controlled area, for which it is desirable to know who is or is not present.

To ascertain whether the controlled area is being entered or quitted, it may be arranged that, in the case of people moving on foot, a corridor be used as the access/egress channel and that two interrogator means be fitted, one located at each end of the corridor. As interrogation of a particular transponder unit by one of the interrogator means will always occur before interrogation by the other such means in time, due to their physical separation, entry and exit of a particular person can be distinguished. For example, interrogation by means A followed by interrogation by means B, could indicate entry into the controlled area by a particular person. Conversely, interrogation by means B followed by interrogation by means A would indicate exit of that person from the controlled area.

Preferably the optoelectronic detectors consist of infra red receiving diodes and the optoelectronic emitters consist of infra red emitting diodes.

Within each transponder unit the optoelectronic emitter is preferably inhibited from operation until reception of the interrogation signal by its optoelectronic detector is completed. To accomplish this, each transponder unit advantageously has a changeover switch which operates to divert power supply from the optoelectronic detector to the optoelectronic emitter when reception of the interrogation signal by said optoelectronic detector has been completed, and to divert power supply from the optoelectronic emitter back to the optoelectronic detector when transmission of the code signal by the former has been completed.

The invention will be described further, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a schematic diagram of an interrogator forming part of a preferred system in accordance with the invention; and

Figure 2 is a schematic diagram of a transponder unit used in conjunction with the interrogator shown in Fig. 1 in a preferred system in accordance with the invention.

Referring firstly to Fig. 1, a preferred interrogator comprises a pulse generator 1 which produces a series of short pulses under the control of a timer 2 such that at regular intervals a continuous stream of pulses (referred to as a pulse train) is produced. These pulses are amplified by an amplifier 3 to drive an infra red emitting diode 4 to irradiate an area in which transponder units are to be interrogated. The timer ensures that on cessation of each pulse train the amplifier 3 is inhibited from operation for a set period during which another amplifier 6, which is connected to an infra red receiving diode 5, is switched on. This effectively switches the interrogator to 'receive' mode and prevents any spurious output signal generation during the set period, which should be sufficiently long to enable a transponder unit being interrogated to send its

coded response to the receiving diode 5. At the end of the set period, the timer 2 inhibits the amplifier 6 and re-activates the amplifer 3 and a further pulse train is produced as a further interrogation signal. This sequence of operation continues indefinitely.

When in the area irradiated by the emitting diode 4, each transponder unit (as shown in Fig. 2) is capable of transmitting its own unique identification code after receipt of an interrogation pulse train.

The transponder unit, as illustrated in Fig. 2, includes an infra red receiving diode 11, the output of which is applied to the amplifier 12. The diode 11 receives the interrogator pulse train and, when this has been concluded, the output of the amplifier 12 operates a changeover switch 13 so as to apply power to the remainder of the circuitry and remove power from the amplifier 12 and the associated receiving diode 11. This prevents spurious operation of the receiving diode 11 whilst the transponder is transmitting.

The remaining circuitry of the transponder unit is actuated by the switch 13 to generate a pulse train, the coding of which is unique to that transponder unit. In this respect, a parallel input signal output shift register 15 is preloaded with a requisite code by a coder 16 and the clock input to the shift register 15 is provided by a pulse generator 14. The output of the serial shift register 15 in the form of a unique code for that particular transponder unit is then amplified by an amplifier 17, the output of which drives an infra red emitting diode 18 to transmit the transponder unit's signal to the interrogator.

The transponder signal is received by the infra red receiving diode 5 incorporated into the interrogator. The output of the diode 5 is amplified by the amplifier 6, which is linked to the timer 2, as previously explained, and the output of the amplifier 6 is fed to a computer for processing as required.

In the transponder unit, the changeover switch 13 reverts to its original state after the emitting diode 18 has completed its transmission so that the cycle of interrogation and response may be repeated until such time as the transponder unit is no longer with the field irradiated by the interrogator. This will ensure multiple reception of a transponder signal enabling comprehensive data corruption checks and error correction to be made by the interrogator computer.

CLAIMS

1. A system of non-contact identification of individual people or vehicles comprising a compact transponder unit carried on each person or vehicle to be identified, each transponder unit including an optoelectronic detector and an optoelectronic emitter, the latter being capable of transmitting a signal embodying a code unique to the respective person or vehicle, and interrogator means also including an optoelectronic detector and an optoelectronic emitter, such that each transponder unit is caused to transmit the signal embodying its unique code upon detection of an interrogation signal from the optoelectronic emitter of the interrogator means, which code signal is then received and processed by the interrogator means.

2. A system as claimed in claim 1 wherein the optoelectronic detectors consist of infra red receiving diodes and the optoelectronic emitters consist of infra red emitting diodes.

3. A system as claimed in claim 1 and 2 wherein the code unique to each transponder unit is loaded into an input serial output shift register of the unit by a coder of the unit which may have up to a sixteen bit capacity for generation of unique codes.

4. A system as claimed in claim 1, 2 or 3 wherein the optoelectronic emitter of each transponder unit is inhibited from operation until reception of the interrogation signal by its optoelectronic detector is completed.

5. A system as claimed in claim 4 wherein each transponder unit has a changeover switch which operates to divert power supply from the optoelectronic detector to the optoelectronic emitter when reception of the interrogation signal by said optoelectronic detector has been completed, and to divert power supply from the optoelectronic emitter back to the optoelectronic detector when transmission of the code signal thereby has been completed.

6. A system as claimed in any preceding claim wherein the interrogator includes a timer which, in alternating sequence, firstly inhibits operation of the optoelectronic detector for a pre-set time period while the optoelectronic emitter is transmitting the interrogation signal, and subsequently inhibits operation of the optoelectronic emitter for a pre-set time period while the optoelectronic detector is operational.

7. A system of non-contact identification people or vehicles substantially as hereinbefore described with reference to and as illustrated by the accompanying drawing.

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